

## CLAIMS

1. An isolated nucleic acid molecule comprising a sequence of nucleotides encoding or complementary to a sequence encoding an haemopoietin receptor from an animal or a derivative of said receptor.
2. An isolated nucleic acid molecule comprising a sequence of nucleotides encoding or complementary to a sequence encoding an animal haemopoietin receptor or a derivative thereof, wherein said receptor:
  - (i) is capable of interaction with IL-13 or its derivatives; and
  - (ii) is capable of interaction with a complex between IL-4 and IL-4 receptor  $\alpha$ -chain.
3. An isolated nucleic acid molecule according to claim 1 or 2 wherein the receptor comprises a derivative of an  $\alpha$ -chain of a haemopoietin receptor capable of interaction with IL-13 with low affinity.
4. An isolated nucleic acid molecule according to claim 1 or 2 wherein the receptor is a derivative of an  $\alpha$ -chain of a haemopoietin receptor capable of interaction with IL-13 with medium to high affinity.
5. An isolated nucleic acid molecule according to claim 1 or 2 encoding a receptor having an amino acid sequence substantially as set forth in SEQ ID NO:2 or SEQ ID NO:4 or having at least about 50% similarity to all or part thereof.

6. An isolated nucleic acid molecule according to claim 1 or 2, wherein the sequence of nucleotides

comprises a sequence of nucleotides encoding a receptor

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7. An isolated nucleic acid molecule comprising a sequence of nucleotides which encodes or is complementary to a sequence which encodes an IL-13 receptor  $\alpha$ -chain or a derivative thereof, said nucleic acid molecule having a nucleotide sequence substantially as set forth in SEQ ID NO:1 or SEQ ID NO:3 or a nucleic acid molecule which encodes a functionally similar IL-13 receptor  $\alpha$ -chain or a derivative thereof and which is capable of hybridising to the nucleotide sequence substantially as set forth in SEQ ID NO:1 or SEQ ID NO:3 or a complementary form thereof under low stringency conditions.

8. An isolated nucleic acid molecule comprising a sequence of nucleotides which encodes or is complementary to a sequence which encodes the IL-13 receptor  $\alpha$ -chain or a derivative thereof having an amino acid sequence substantially as set forth in SEQ ID NO:2 or SEQ ID NO:4 or comprises a nucleotide sequence coding for an amino acid sequence having at least about 50% similarity to the sequence set forth in SEQ ID NO:2 or SEQ ID NO:4 and is capable of hybridising to the sequence set forth in SEQ ID NO:1 or SEQ ID NO:3 under low stringency conditions.

9. An isolated nucleic acid molecule according to claim 1 or 2 or 7 or 8 which encodes a haemopoietin receptor capable of interaction with IL-13 or its derivatives, which interaction is capable of competitive inhibition by IL-4 or a derivative thereof in cells which express an IL-4 receptor  $\alpha$ -chain.

10. A genetic construct comprising a nucleic acid molecule according to claim 1 or 6 or 7 operably linked to a promoter capable of directing expression of said nucleic acid molecule in a host cell.

comprising a polypeptide sequence substantially as set forth in SEQ ID NO:2 or SEQ ID NO:4 or having at least about 50% similarity to all or part thereof, said polypeptide capable of interaction with IL-13 or its derivatives.

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12. A recombinant polypeptide according to claim 11 wherein the interaction with IL-13 is competitively inhibited by IL-4 in cells which express an IL-4 receptor  $\alpha$ -chain.

13. A recombinant polypeptide according to claim 11 wherein the interaction with IL-13 is with low affinity.

14. A recombinant polypeptide according to claim 10 wherein the interaction with IL-13 is with medium to high affinity.

15. A recombinant polypeptide according claim 11 wherein said polypeptide has a molecular weight of from about 50,000 to about 70,000 daltons as determined by Western blot analysis when expressed in COS cells.

16. A recombinant polypeptide having at least two of the following characteristics:

- (i) comprises an amino acid sequence substantially as set forth in SEQ ID NO:2 or SEQ ID NO:4 or having at least about 50% similarity to all or part thereof;
- (ii) is encoded by a nucleotide sequence substantially as set forth in SEQ ID NO:1 or SEQ ID NO:3 or having at least about 50% similarity to all or part thereof;
- (iii) interacts with IL-13 or its derivatives with at least low affinity; and
- (iv) has a molecular weight of from about 50,000 to about 70,000 daltons as determined by Western blot analysis when expressed in COS cells.

or SEQ ID NO:4 or having at least about 50% similarity to all or part thereof;

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- (ii) is encoded by a nucleotide sequence substantially as set forth in SEQ ID NO:1 or SEQ ID NO:3 or having at least about 50% similarity to all or part thereof;
  - (iii) interacts with IL-13 or its derivatives with at least low affinity;
  - (iv) has a molecular weight of from about 50,000 to about 70,000 daltons as determined by Western blot analysis when expressed in COS cells;
  - (v) comprises an amino acid sequence derived from IL-4 receptor  $\alpha$ -chain; and
  - (vi) is capable of interaction with IL-13 which is competitively inhibited by IL-4 in cells which express an IL-4 receptor  $\alpha$ -chain.
18. An antibody to the recombinant polypeptide according to claim 16 and 17.
19. An antibody according to claim 16 wherein said antibody is a monoclonal antibody.
20. A hybrid haemopoietin receptor capable of interaction with at least two cytokines wherein at least one of said cytokines is IL-13 or its derivatives and wherein said hybrid receptor comprises an amino acid sequence which includes all or part of the amino acid sequence set forth in SEQ ID NO:2 or SEQ ID NO:4.
21. A hybrid haemopoietin receptor capable of high affinity interaction with at least one cytokine wherein at least one of said cytokines is IL-13 or its derivatives and wherein said hybrid receptor comprises an amino acid sequence which includes all or part of the amino acid sequence set forth in SEQ ID NO:2 or SEQ ID NO:4.
23. A hybrid haemopoietin receptor according to claim 21 capable of interaction with a

24. A pharmaceutical composition comprising a recombinant polypeptide according to claim 16 or 17 and one or more pharmaceutically acceptable carriers and/or diluents.
25. A genetic pharmaceutical composition comprising a nucleic acid molecule according to claim 1 or 2 or 7 or 8 and one or more genetically acceptable carriers and/or diluents.
26. A method of treatment in an animal comprising administering to said animal a treatment effective amount of a recombinant polypeptide according to claim 16 or 17
27. A method of treating asthma, allergy or a condition exacerbated by IgE production in an animal comprising administering to said animal a treatment of an effective amount of a recombinant polypeptide according to claim 16 or 17.
28. A method of producing a recombinant polypeptide having at least two of the following characteristics:
- (i) comprises an amino acid sequence substantially as set forth in SEQ ID NO:2 or SEQ ID NO:4 or having at least about 50% similarity thereto;
  - (ii) is encoded by a nucleotide sequence substantially as set forth in SEQ ID NO:1 or SEQ ID NO:3 or having at least about 50% similarity thereto;
  - (iii) interacts with IL-13 or its derivatives with at least low affinity; and
  - (iv) has a molecular weight of from about 50,000 to about 70,000 daltons as determined by Western blot analysis when expressed in COS cells,
- said method comprising culturing cells comprising the genetic construct according to claim 10 for a time and under conditions sufficient to express the nucleic acid molecule in said

29 A method of producing a recombinant polypeptide having at least three of the following characteristics:

- (i) comprises an amino acid sequence substantially as set forth in SEQ ID NO:2 or SEQ ID NO:4 or having at least about 50% similarity to all or part thereof;
- (ii) is encoded by a nucleotide sequence substantially as set forth in SEQ ID NO:1 or SEQ ID NO:3 or having at least about 50% similarity to all or part thereof;
- (iii) interacts with IL-13 or its derivatives with at least low affinity;
- (iv) has a molecular weight of from about 50,000 to about 70,000 daltons as determined by Western blot analysis when expressed in COS cells;
- (v) comprises an amino acid sequence derived from IL-4 receptor  $\alpha$ -chain; and
- (vi) is capable of interaction with IL-13 which is competitively inhibited by IL-4 in cells which express an IL-4 receptor  $\alpha$ -chain.

said method comprising culturing cells comprising the genetic construct according to claim 10 for a time and under conditions sufficient to express the nucleic acid molecule in said genetic construct to produce a recombinant polypeptide and isolating said recombinant polypeptide.

30 Animal cells which express the recombinant polypeptide produced by the method according to claim 28 and 29

31 A chimeric protein comprising a first portion capable of interaction with IL-13 or its derivatives and a second portion derived from a haemopoietin receptor, a receptor tyrosine

32 A chimeric protein according to claim 31 wherein the second portion comprises at least a functional portion of IL-13 binding protein, IL-4 receptor  $\alpha$ -chain, IL-2 receptor  $\gamma$ -chain or

33. A method for monitoring the level of IL-4 in a biological sample said method comprising incubating said biological sample with cells which express NR4 and IL-4 receptor  $\alpha$ -chain together with an effective amount of IL-13 to competitively inhibit IL-4 binding to its receptor and determining the extent of competitive inhibition.

34. A method for monitoring the level of IL-13 in a biological sample said method comprising incubating said biological sample with cells which express NR4 and IL-4 receptor  $\alpha$ -chain together with an effective amount of IL-4 to competitively inhibit IL-13 binding to its receptor and determining the extent of competitive inhibition.

35. A method according to claim 33 or 34 wherein the cytokines are labelled with a reporter molecule.